Organoleptic Properties of Frankfurters Made from Giblet Meats[1]

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INTRODUCTION

AS POINTED out by May and Hudspeth (1966), the advent of commercial deboning machines made it feasible to consider poultry meat for use in emulsion type sausage products such as frankfurters. Economic considerations would indicate that only the lower value parts of the carcass would be useful for such a purpose.

Four of the parts of the carcass which might logically be considered for use in emulsion products are neck, back, gizzard and heart. Normally in broiler class chickens three of these, neck, gizzard and heart are components of the giblet pack and are merchandized by placing them inside the carcass cavity. The usual additional part in the giblet pack is liver. In most markets the carcass without giblets can be sold at a higher price. Liver usually is sold at prices in excess of the carcass price.

The objective of this research was to determine the organoleptic acceptability of frankfurters prepared from necks, gizzards and hearts in various proportions.

EXPERIMENTAL

Source of meat. Raw, machine deboned broiler neck meat, including skin in natural proportions, was obtained in 27.2 kg. frozen blocks from a commercial firm. Meat was cut as needed from the frozen block with a meat saw. Fresh broiler hearts and gizzards, obtained from a local source, were washed, ground, placed in 454 g. quantities into freezer paper and frozen until needed. Fresh beef and pork trim were ground, packaged and stored in the same manner.

TABLE 1.—*Composition of meat block in various experiments*

	Neck %	Gizzard %	Heart %	Beef %
Experiment 1.				
Treatment 1	100	0	0	0
Treatment 2	80	15	5	0
Treatment 3	65	30	5	0
Treatment 4	50	45	5	0
Treatment 5	50	40	10	0
Experiment 2.				
Treatment 1	100	0	0	0
Treatment 2	80	15	5	0
Treatment 3	65	30	5	0
Treatment 6	40	15	5	40
Treatment 7	0	0	0	100

Frankfurter formulation. The sausage formula consisted of 60 g. NaCl, 0.5 g. sodium nitrite, 9 g. of a commercial frankfurter seasoning, 136 g. non-fat dried milk, 341 g. ice, 341 g. pork trim, 1.4 g. ascorbic acid and 2270 g. of boneless meat block of various composition (Table 1).

The meat block, seasoning and dried milk were placed in a Hobart food chopper which had been precooled with ice. After chopping for 2 minutes, the pork trim was added gradually, followed by the ice and chopping was continued until the emulsion reached a temperature of 14.4 to 15.6°C. The emulsion was then run through a Kol-

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TABLE 2.—*Significance of mean flavor scores of frankfurters at the 0.05 level of probability*[1]

No.	Treatment	Mean score[2]
6	40% neck, 15% gizzard, 5% heart, 40% beef	6.17
1	100% neck	6.13
3	65% neck, 30% gizzard, 5% heart	5.88
5	50% neck, 40% gizzard, 10% heart	5.71
2	80% neck, 15% gizzard, 5% heart	5.68
4	50% neck, 45% gizzard, 5% heart	5.54
7	100% beef	3.77

[1] As calculated by the Duncan test.
[2] Any 2 means not bordered (on the right) by the same line are significantly different at the 0.05 level of probability. Possible range in score was 1 to 9 with higher scores indicating better flavor. A score of 5 represents acceptable flavor.

loid emulsifier, stuffed in 20–21 mm. No Jax artificial casings and placed on twisticks. The frankfurters were placed in a smokehouse which had been preheated to 54.4°C. The thermostat of the smokehouse was set at 93.3°C. and cooking allowed to continue until internal temperature of the frankfurters reached 71°C. (approximately 3 hours). The frankfurters were then placed under a shower of tap water for 8 minutes after which they were removed from the racks and held at 3.3°C. until used.

Organoleptic evaluation. Six persons served on the taste panel. Frankfurters were warmed in 100°C. water then evaluated for flavor, color and texture using a nine-point hedonic scale ranging from unacceptable to very desirable for each attribute.

Two experiments were conducted using formulations for the meat block as shown in Table 1. In each experiment 5 replicate evaluations were made of each treatment. The data from the two experiments were combined for statistical evaluation by the multiple range test of Duncan (1955).

In preliminary experiments frankfurters were also made using hearts or gizzards as 100 percent of the meat block.

Chemical analyses. Frankfurters from four of the formulas which received acceptable organoleptic evaluations were analyzed for moisture, protein and fat using standard A.O.A.C methods (1955).

RESULTS AND DISCUSSION

Frankfurters made with either hearts or gizzards as 100 percent of the meat block were found to be entirely unsatisfactory. A very pronounced, undesirable flavor was present in the frankfurters made from hearts. Frankfurters made from gizzards also had a slightly undesirable flavor but the major defect was in texture. The texture of the gizzard meat frankfurters was very crumbly with distinct pieces of meat visible rather than a homogenous structure. This was not unexpected since May and Hudspeth (1966) reported that gizzards had much less soluble protein than did neck meat although they were much higher in total protein. Since soluble protein is the primary binding agent (Helmer and Saffle, 1963) gizzards would not be expected to make good frankfurters if used as such a large percentage of the finished product.

Flavor of all frankfurters from all formulations except the 100 percent beef was satisfactory (Table 2). The very low score of the 100 percent beef frankfurters was probably due to their extreme dryness and very poor appearance. The formulation used was designed for chicken meat and was too low in added moisture and fat to make good beef frankfurters.

None of the frankfurters made from various chicken meat formulations differed significantly in flavor. Formulation numbers 1 (100 percent neck meat) and 6 (40 percent beef) had the highest scores.

Considerable variation was found in mean color scores of frankfurters made from the seven formulations (Table 3). The 100 percent beef frankfurter had significantly better color than any other formulation. The 100 percent neck meat frankfurters received the lowest mean color score. Addition of gizzards and hearts to the meat block tended to increase the desirability of color although the differences were not statistically significant with the

numbers used. Frankfurters made from neck meat tended to be very pale pink in color, those made from beef a dark pink to light red and those with gizzard and heart intermediate in color.

All formulations resulted in frankfurters of acceptable texture except those which contained beef (Table 4). The chicken meat frankfurters were firm but had none of the toughness or rubberness of frankfurters which is often encountered according to Simon *et al.* (1965). Again, it is pointed out that the formulation used was not designed to obtain the best possible beef product.

An overall evaluation of organoleptic results would indicate that acceptable frankfurters were made from blends of chicken neck meat, gizzards and hearts either with or without added beef. Addition of gizzards and hearts to neck meat tended, within the limits studied, to improve color without seriously affecting texture and flavor.

Addition of hearts and gizzards to neck meat formulations for frankfurters increased the percentage of protein in the final product (Table 5). Thus, it might be possible to increase fat or moisture in formulas where gizzards and hearts are substituted for neck meat.

An additional advantage of use of gizzards and hearts in a chicken frankfurter is that no deboning cost would be involved.

Further experimentation would be necessary to determine the optimum blend of neck meat, gizzards and hearts for the best final frankfurter product.

TABLE 3.—*Significance of mean color scores of frankfurters at the 0.05 level of probability*[1]

No.	Treatment	Mean score[2]
7	100% beef	8.00
6	40% neck, 15% gizzard, 5% heart, 40% beef	5.17
4	50% neck, 45% gizzard, 5% heart	4.17
5	50% neck, 40% gizzard, 10% heart	3.92
2	80% neck, 15% gizzard, 5% heart	3.37
3	65% neck, 30% gizzard, 5% heart	3.37
1	100% neck	2.91

[1] As calculated by the Duncan test.
[2] Any 2 means not bordered (on the right) by the same line are significantly different at the 0.05 level of probability. Possible range in score was 1 to 9 with higher scores indicating darker color. A score of 5 represents acceptable color.

TABLE 4.—*Significance of mean texture scores of frankfurters at the 0.05 level of probability*[1]

No.	Treatment	Mean score[2]
2	80% neck, 15% gizzard, 5% heart	6.48
1	100% neck	6.40
5	50% neck, 40% gizzard, 10% heart	6.38
3	65% neck, 30% gizzard, 5% heart	6.36
4	50% neck, 45% gizzard, 5% heart	6.25
6	40% neck, 15% gizzard, 5% heart, 40% beef	4.97
7	100% beef	1.90

[1] As calculated by the Duncan test.
[2] Any 2 means not bordered (on the right) by the same line are significantly different at the 0.05 level of probability. Possible range in score was 1 to 9 with the higher scores indicating better texture. A score of 5 represents acceptable texture.

TABLE 5.—*Chemical analysis of frankfurters from four of the treatments*

Wet-weight basis	Treatment			
	1	2	4	6
Protein (%)	14.0	15.3	15.9	17.4
Fat (%)	30.0	26.5	26.0	18.9
Moisture (%)	55.5	56.8	57.0	58.7

SUMMARY

Frankfurters were prepared using various proportions of neck meat, gizzards and hearts from broiler class chickens. Products made using heart or gizzard as the sole source of meat were not acceptable due to flavor characteristics and, in the case of gizzard, texture characteristics.

Adding gizzards and hearts to neck meat increased mean color scores of frankfurters, although these means were not significantly different with the numbers used. Satisfactory texture and flavor were evident in several formulations of frankfurters using neck meat, gizzards and hearts but color was not as acceptable.

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Studies on the Vitamin Requirements of Poultry

8. GENETIC DIFFERENCES IN THE REQUIREMENTS FOR NIACIN AND RIBOFLAVIN OF MEAT-TYPE AND EGG-TYPE CHICKS

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BEFORE 1959, little informtion was available on the vitamin requirements of chicks reared in Japan. Therefore, the recommendation of the National Academy of Sciences—National Research Council, U.S.A. (1954) had been used as a guide in the practical formulation of poultry feed. Yoshida *et al.* (1959) reported that the White Leghorn chicks in Japan required more of some B-vitamins than the NAS-NRC recommended levels and subsequently experiments on the vitamin requirements of White Leghorn chicks were carried out at this Laboratory (Yoshida and Morimoto, 1960, 1961; Yoshida *et al.*, 1962a, b). When the geneticists of this Institute introduced White Plymouth Rock chicks of U.S. origin in 1960, some of the imported chicks suffered leg weakness. The birds were fed the stock diet of the Institute, fortified with B-vitamins according to the data obtained in the experiments mentioned above with White Leghorn chicks. Curled-toe paralysis and perosis were observed among the White Plymouth Rock chicks and vitamin supplementation of the diet was effective in curing and preventing the symptoms. Accordingly, the requirements for B-vitamins of the White Plymouth Rock chicks supplied by the geneticists of this Institute were studied extensively (Yoshida et al., 1963a, b). On the basis of the results of these studies, all the stock diets of the Institute were re-fortified with B-vitamins.

Since then no trouble from vitamin deficiency was reported at the poultry farm of this Institute, until the geneticists imported White Cornish male chicks directly from U.S.A. in 1961. They also suffered curled-toe paralysis and perosis and in addition had dermatitis on the legs. These symptoms were alleviated and prevented by fortification of the diet with B-vitamins. Similar symptoms of leg weakness were observed at that time at some of the National Breeding Stations and by commerical breeeders in Japan, who imported the meat-type chicks.

The field information and laboratory observations suggested that a difference in vi-